Converting Sustainable Forest Products into Fuel:
What it takes to have a successful wood pellet manufacturing business

Presented at

The Biomass Renewable Energy Opportunities and Strategies Forum

July 9, 2014

Presented by
Dr. William Strauss
President, FutureMetrics
Director, Maine Energy Systems
Chief Economist, Biomass Thermal Energy Council
FutureMetrics LLC

Globally Respected Consultants in Wood Pellet Project Development

8 Airport Road
Bethel, ME 04217, USA
FutureMetrics Services:

Research, analysis, and strategic guidance for the wood pellet sector.

We combine data driven analysis with a depth of knowledge across the pellet sector to provide full spectrum reporting that enables our clients to make optimal decisions.

Selection of Clients
Dr. William Strauss, President, FutureMetrics

Recipient of the 2012 International Excellence in Bioenergy Award
Environmental, Social, Ecological, and Economic Sustainability

Fossil Fuel Production (Coal, Petroleum, NG...)

Source: Various forecasts aggregated by FutureMetrics.
What are Wood Pellets?

- Wood pellets are compressed dried wood fiber.
- They are about 1.3 times more dense than wood.
- They are an energy source that is renewable and are manufactured using an established and proven production process.
- The pellets have a cylindrical form and are typically 5/16 of an inch in diameter and 1.0 to 1.5 inches long.
- They are an easily managed and free flowing.
- The average wood pellet has about 8500 BTU per pound (17.5 gigajoules per metric tonne).
Crown
Branches used as fuel
Except slash (incl. foliage) left-over
Or eventually burnt in most of the cases

Stemwood
Economic preference: Used first by sawmills and pulp and paper depending on diameter/structure
Shape and fibre structure be qualitative for material uses

"Roundwood"

Roots
Left in the ground

Wood Pellet Plant

Industry Processing Sawmills

On-Site or Off-Site Processing

Forestry By-Products

Industry By-Products

Courtesy of WPAC, FPInnovation Canada, and Enviva
Annual Propane, Heating Oil, and Pellet Fuel Cost for the Average Home in the Northern States
(for the equivalent heat from a central heating system)

- Propane
- Heating Oil
- Wood Pellet Fuel

Feb-2014, $4,560
May-2014, $3,755
May-2014, $3,249
May-2014, $1,467

Source: EIA, 2014, Analysis by FutureMetrics
What is the Market?

First, the Domestic Heating Market
US Annual Pellet Demand for Domestic Heating (tons)

- Annual Pellet Demand (tons)
- Expected Demand
- Upper 95% Confidence Band
- Lower 95% Confidence Band

Source: for pellet stoves, HPBA, 2014; for pellet boilers, FutureMetrics data; Forecast and Analysis by FutureMetrics
The primary uses of heating pellets in the US are homes with pellet stoves. However, modern fully automated wood pellet boiler systems that are common in Europe are becoming more common in the US (more on pellet boilers later).
Heating Energy Source by State

Source: EIA, October, 2013, Analysis by FutureMetrics
How far can natural gas penetrate into the heating market?
A very optimistic scenario might suggest that by 2020 most urban centers will have natural gas.
But that will leave a lot of homes and business on heating oil or propane.

Source: EIA and US Census, 2013, Analysis by FutureMetrics (curves are fitted to the data)
Households in Rural Areas Not on Natural Gas Adjusted for Each State’s Sustainable Growth of Pellet Quality Wood

(percents show proportion of rural homes that can be converted by each state’s sustainable resource - assumes no interstate pellet trade)

Total = 4,322,044

source: EIA, US Census and US Forest Service Inventory Data, 2014, Analysis by FutureMetrics
Wood pellet production for domestic heating use can replace heating oil and propane and create jobs.
Most know about pellet stoves. What about pellet boilers?
The central heating systems of tomorrow are here today.

The MESys AutoPellet boiler is the world’s finest fully-automatic wood pellet central heating system. The AutoPellet is a standalone system and is designed to meet the heat and domestic hot water demands of households, businesses, institutions and municipal buildings.
Automatic Auger or Vacuum Fuel Feed
From the pellet mill to the burner, you never see or touch the fuel.

Automatic Heat Exchanger Cleaning
Heat exchanger tubes are automatically cleaned daily, only requiring annual cleaning. There is no need to shut or cool down the MESys AutoPellet for routine cleaning.

Bottom Fed Burner
Our bottom fed burner design eliminates emptying ash from the burn chamber for a restart, this results in no by-product build up. After a period of low-demand, only the application of air is commonly necessary to restart.

AutoPellet Features:
- Automated Three-Way Ash Removal
- ASME Certified (where necessary)
- OMNI Listed to UL Standards
- Up to 87.7% Efficient
- Two-Stage Combustion
- Stainless Steel Combustion Chamber
- Digital LCD Controller Interface
- 30-Year Warranty
- Bottom Fed Burner
- Programmable Logic Controller for Modulated Heat Output
- External Detachable Ash Container
- Automatic Electric Ignition
- Burner Mountable on Left or Right
- Automatic Heat Exchanger Cleaning
- Burnback Fire Prevention Through Air Tight Spring Actuated Valve
- Auto Auger or Vacuum Fuel Feed
- Combustion Sensor (Monitors Efficiency)
- Pressure Sensor and Flue Gas Fan Safely Control Draft
AutoPellet = automatic ash removal.

The MESys AutoPellet boiler is designed to make your life easier. Pellet ash is automatically removed from the boiler and compressed into the integrated ashbox. The ashbox can hold ash from 2 tons of burned pellets before emptying. There is no need to shut the system down for ash removal or wear heat-protective mitts.

With a simple twist of the lever, the ashbox is detached from the boiler. The ashbox is then placed on top of the storage container, emptied, and returned back to the boiler.

This is a quick, clean and easy task and the ash is great for your lawn or garden.
**Complete self-contained heating.**

The MESys Energy Box is a complete self-contained heating system suitable for almost any application. Each Energy Box contains wood pellet storage, MESys AutoPellet boiler(s), flue and fuel supply system.

An ideal solution for municipalities, school districts and commercial applications where indoor space is limited, the Energy Box is also applicable for temporary buildings as the entire unit can easily be relocated to another site with minimal work. The Energy Box is delivered, ready for installation, by truck and is connected to the heating system in a matter of hours.

<table>
<thead>
<tr>
<th>Type I</th>
<th>Type II</th>
<th>Type III-IV</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="Image" /></td>
<td><img src="image2.png" alt="Image" /></td>
<td><img src="image3.png" alt="Image" /></td>
</tr>
<tr>
<td>191 MBtu / hr</td>
<td>245-382 MBtu / hr</td>
<td>492-765 MBtu / hr</td>
</tr>
<tr>
<td>20.3 x 8 x 8.7 feet</td>
<td>33.8 x 8 x 8.7 feet</td>
<td>40.4 x 8 x 8.7 feet</td>
</tr>
<tr>
<td>1 MESys AutoPellet Boiler</td>
<td>2 MESys AutoPellet Boilers</td>
<td>3 or 4 MESys AutoPellet Boilers</td>
</tr>
<tr>
<td>9.5 Ton Pellet Storage</td>
<td>15 ton pellet storage</td>
<td>14 ton pellet storage</td>
</tr>
</tbody>
</table>

MESys Energy Boxes can also be customized to fit your heating needs.
500+ trained and certified installation contractors.

Our wood pellet boiler specialists have matched hundreds of happy customers to the appropriate MESys installation contractor. We have trained over 500 plumbing and heating professionals to install, configure, and maintain MESys boilers.

Contact us to find the contractor that's right for you.

Contractor coverage areas:

- Alaska
- Canada (Northwest Territory)
- Connecticut
- Maine
- Massachusetts
- New Hampshire
- New York
- Pennsylvania
- Rhode Island
- Vermont
Bulk wood pellet delivery.

You don’t handle your oil or propane and with our fully-automated system, you’ll never touch your pellets either. Delivered directly to your home or business, bagless, by a delivery truck the same way as oil or propane.

A typical home requires just 3 deliveries annually.
Fuel storage for **any** application.

From 1/2 Ton to 50 Tons, We Can Store It All
With many sizes and configurations available, our wood pellet storage options are designed to fit your space and needs. These options ensure safe, automatic, reliable movement of the wood pellets from bulk storage to the burner. Our FleXILO storage bags are well suited for indoor spaces where space is limited.

**Vacuum Fuel Feed**
For installations that require pellet storage to be in a separate location from the boiler, vacuum delivery may be used. Maximum distance between storage and boiler in this case is 66 feet.
Imagine...

TAKING A VACATION WITH YOUR FUEL SAVINGS

Switch to the world’s finest fully-automated wood pellet boiler. The boiler that saves more than it costs.

- Automatic Operation
  Just Turn Your Existing Thermostat
- No Fuel Handling
  Delivered in Bulk / Automatically Fed
- Automatic Ash Removal
  No Ash to Touch
- Clean Burning
  Exceeds all EPA Emission Standards
- Reliable
  40,000+ Units in Service Worldwide
- Affordable Fuel
  Lock-in at $1.99 / Gallon Oil Equivalent

Contact Us
Stop being held hostage by your heating system.

SERIOUSLY...

DON’T BURN YOUR MONEY.

If you think your cost of heating is high, switch to the world’s finest fully-automated wood pellet boiler, it saves more than it costs.

- Automatic Operation
  Just Turn Your Existing Thermostat
- No Fuel Handling
  Delivered in Bulk / Automatically Fed
- Automatic Ash Removal
  No Ash to Touch
- Clean Burning
  Exceeds all EPA Emission Standards
- Reliable
  40,000+ Units in Service Worldwide
- Affordable Fuel
  Lock-in at $1.99 / Gallon Oil Equivalent

Contact Us
How’s $1.99 / gallon for the next 2 years sound?
BEAT OIL! & Stay Warm

$1.99

ENERGY GUARANTEED TWO YEARS*

AutoPellet Boilers
- Automatic Operation
- Automatic Ash Removal
- Automatic Fuel Delivery
- No Fuel Handling
- Highly Efficient
- 40,000+ Units in Service
- Clean Burning

FINANCING AVAILABLE
- FHA guaranteed loans from Admirals Bank.
- Pellet fuel and boiler payment may be less than just your oil bill.

MAINE ENERGY SYSTEMS
(207) 824-NRGY (6749) • MaineEnergySystems.com

* Maine Energy Systems guarantees the delivery of bogpine bulk wood pellets at the price of $1.99 when purchased in 1,200+ gallon heating oil, within 30 miles of Bath, Maine through June 2014.
** Financing available disclosure here. *** Financing available disclosure here. **** Financing available disclosure here.
Modern Wood Pellet Boilers are CLEAN and completely automatic

Total Pounds of Particulate per Year
normalized to the equivalent of the BTU from 1000 gallons of heating oil per year

- Fireplace: 3920.0
- Uncertified Wood Stove: 644.0
- EPA Certified Wood Stove: 196.0
- Pellet Stove: 68.6
  - Old Oil Boiler (pre-1990s): 10.08
- Modern European Pellet Fuel Boiler: 2.94
  - Modern Oil Boiler: 2.52
- Gas Boiler: 1.16

To put this into perspective, let’s compare using a half of a ton of wood in a fireplace and the equivalent energy from wood pellets in a modern pellet boiler.

375 pounds

Particulate emissions (SMOKE!)

0.28 pound
What is the Industrial Pellet Market?

27 million metric tonnes per year by 2020*

74,000 tonnes per day!
(more than a shipload per day)

Europe alone = 20 million TPY

Source: Hawkins-Wright, October, 2013
What is the Market?

Current Industrial pellet production in North America (the primary supplier to the UK and EU now) is about 5 million tonnes per year.

There is a capacity gap, of 22 million tonnes per year that has to be filled in the next 6 years.

And

Korea’s emission trading scheme starts January 2015...

Japan...?

Source: Hawkins-Wright, October, 2013
One example: Drax
7.5 million tons per year by 2015-16.
Unit #2 running on 100% pellets at full capacity – 650 MW
Forecast Industrial Pellet Flows by 2016

Source: ProPellets, 2014
What about the North American Industrial Pellet Market?

Plenty of production capacity with rich sustainable fiber baskets able to provide renewing feedstock for much higher levels of production.

![Diagram showing production capacity and export capacity for North American Industrial Pellet Market.](image)

- **Current Export Production**: 4,926,000 tons
- **Current Domestic Production**: 3,533,000 tons
- **US Capacity Under Construction**: 2,754,000 tons

**Domestic Plant Production Capacity Factor at 78%**

- **Export Plant Production Capacity Factor at 90%**: 7,629,000 tons for export, 3,584,000 tons for domestic use

*Source: BBI pellet mill database, analysis by FutureMetrics*
<table>
<thead>
<tr>
<th>Power Source</th>
<th>Construction, Conversion, or New Pollution Control Cost per kW</th>
<th>Size (MW)</th>
<th>Capacity Factor</th>
<th>Install Cost</th>
<th>Annual Capital Cost Amortization</th>
<th>Annual Output (MWh_year)</th>
<th>Fixed Capital Cost per MWh_year</th>
<th>Fixed and Variable O&amp;M per MWh_year</th>
<th>Fuel Cost per MWh_year</th>
<th>Total Cost per MWh_year (at the power station bus bar)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydro</td>
<td>$ -</td>
<td>1000</td>
<td>90.0%</td>
<td>$ -</td>
<td>$ -</td>
<td>$ 7,884,000</td>
<td>$ -</td>
<td>$ 4.10</td>
<td>$ -</td>
<td>$ 4.10</td>
</tr>
<tr>
<td>Pulverized Coal (older than 35 years)**</td>
<td>$ 380</td>
<td>610</td>
<td>85.0%</td>
<td>$ 231,800,000</td>
<td>$ 15,988,141</td>
<td>$ 4,542,060</td>
<td>$ 3.52</td>
<td>$ 5.60</td>
<td>$ 5.77</td>
<td>$ 14.89</td>
</tr>
<tr>
<td>Natural Gas Combined Cycle</td>
<td>$ 1,230</td>
<td>580</td>
<td>90.0%</td>
<td>$ 713,400,000</td>
<td>$ 49,205,951</td>
<td>$ 4,572,720</td>
<td>$ 10.76</td>
<td>$ 1.70</td>
<td>$ 9.38</td>
<td>$ 21.84</td>
</tr>
<tr>
<td>Conversion: Pulverized Coal to Pellets*</td>
<td>$ 210</td>
<td>600</td>
<td>85.0%</td>
<td>$ 125,000,000</td>
<td>$ 8,690,706</td>
<td>$ 4,467,600</td>
<td>$ 1.95</td>
<td>$ 5.50</td>
<td>$ 16.59</td>
<td>$ 24.03</td>
</tr>
<tr>
<td>Nuclear</td>
<td>$ 6,100</td>
<td>1125</td>
<td>90.0%</td>
<td>$ 6,862,500,000</td>
<td>$ 473,332,107</td>
<td>$ 8,869,500</td>
<td>$ 53.37</td>
<td>$ 11.90</td>
<td>$ 0.60</td>
<td>$ 65.76</td>
</tr>
<tr>
<td>Landbased Wind</td>
<td>$ 1,900</td>
<td>50</td>
<td>25.0%</td>
<td>$ 90,000,000</td>
<td>$ 6,828,412</td>
<td>$ 109,500</td>
<td>$ 62.36</td>
<td>$ 13.00</td>
<td>$ -</td>
<td>$ 75.36</td>
</tr>
<tr>
<td>Offshore Wind</td>
<td>$ 3,230</td>
<td>50</td>
<td>35.0%</td>
<td>$ 161,500,000</td>
<td>$ 11,139,278</td>
<td>$ 153,300</td>
<td>$ 72.66</td>
<td>$ 22.80</td>
<td>$ -</td>
<td>$ 95.46</td>
</tr>
<tr>
<td>Solar PV</td>
<td>$ 4,340</td>
<td>100</td>
<td>30.0%</td>
<td>$ 434,000,000</td>
<td>$ 29,934,655</td>
<td>$ 262,800</td>
<td>$ 113.91</td>
<td>$ 11.40</td>
<td>$ -</td>
<td>$ 125.31</td>
</tr>
</tbody>
</table>

* Assumes CAPEX is only for the conversion since the plants are over 35 years old and all installed CAPEX costs have been recouped.

** New CAPEX is for emissions controls for SO2, NOx, and mercury. Higher O&M costs are for operating the flue gas control systems. Values from a number of plant case studies.


This scenario assumes that the coal plants and the converted coal plants are over 35 years old and thus all original installed CAPEX have been recouped. However, new emissions control systems are installed and operated.

Source: see table above; Analysis by FutureMetrics.
Pellet fuel is 2.88 times more expensive than coal for a reason. The supply chain requires more labor.

Analysis on pellet jobs by FutureMetrics using IMPLAN. Data on coal employment from “U.S. Coal Exports: National and State Economic Contributions”, Ernst & Young, May, 2013. Both include direct, indirect, and induced jobs. Analysis by FutureMetrics
Case Study:
What is the Opportunity for the XXX Site
And
The Aroostook Band of the Micmacs?
Two Key Questions:

Is there wood supply at volumes and prices that will support a pellet mill?

Is there a market for the pellets?
A wood study was done for FutureMetrics

60 minute drive time and 25 mile radius

<table>
<thead>
<tr>
<th>Distance in Miles</th>
<th>15</th>
<th>20</th>
<th>25</th>
<th>30</th>
<th>35</th>
<th>40</th>
<th>45</th>
<th>50</th>
<th>55</th>
<th>60</th>
<th>65</th>
<th>70</th>
<th>75</th>
<th>80</th>
<th>85</th>
<th>90</th>
<th>95</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delivered Cost per Green Ton</td>
<td>$23.22</td>
<td>$24.49</td>
<td>$25.77</td>
<td>$27.04</td>
<td>$28.32</td>
<td>$29.60</td>
<td>$30.87</td>
<td>$32.15</td>
<td>$33.42</td>
<td>$34.70</td>
<td>$35.97</td>
<td>$37.25</td>
<td>$38.53</td>
<td>$39.80</td>
<td>$41.08</td>
<td>$42.35</td>
<td>$43.63</td>
<td>$44.90</td>
</tr>
</tbody>
</table>
Within this region roughly 230,000 green tons are available annually. Of this, roughly 125,000 green tons are in non-sawlog material, and would be economically appropriate for use in wood pellet manufacturing.

<table>
<thead>
<tr>
<th>Net Growth</th>
<th>Softwood</th>
<th>Hardwood</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>all</td>
<td>124,998</td>
<td>106,581</td>
<td>231,579</td>
</tr>
<tr>
<td>sawtimber</td>
<td>86,564</td>
<td>21,230</td>
<td>107,793</td>
</tr>
<tr>
<td>non-sawtimber</td>
<td>38,434</td>
<td>85,352</td>
<td>123,786</td>
</tr>
</tbody>
</table>

![Diagram showing the price of hardwood and softwood over time, with fluctuations ranging from $30.00 to $60.00.](image)
There would appear to be sufficient wood for a modestly sized plant.

There are two potential markets for pellets manufactured at the XXX site:
• The Micmac’s own set of buildings and
• The retail market in the region.
Micmac Buildings

<table>
<thead>
<tr>
<th>One Year Fuel Usage (June, 2010 - May 2012)</th>
<th>Heating Oil Gallons</th>
<th>Cost</th>
<th>$/gal</th>
<th>Pellet Equivalent Tons</th>
<th>Cost at $145 per ton</th>
</tr>
</thead>
<tbody>
<tr>
<td>Micmac Service Unit</td>
<td>1,156</td>
<td>$3,716</td>
<td>$3.216</td>
<td>9.38</td>
<td>$1,360</td>
</tr>
<tr>
<td>Admin - 7 Northern Rd.</td>
<td>5,365</td>
<td>$17,255</td>
<td>$3.216</td>
<td>43.55</td>
<td>$6,315</td>
</tr>
<tr>
<td>Little Feathers Head Start</td>
<td>2,061</td>
<td>$6,435</td>
<td>$3.123</td>
<td>16.73</td>
<td>$2,426</td>
</tr>
<tr>
<td>Spruce Haven</td>
<td>3,418</td>
<td>$11,096</td>
<td>$3.247</td>
<td>27.74</td>
<td>$4,023</td>
</tr>
<tr>
<td>Farm</td>
<td>650</td>
<td>$2,090</td>
<td>$3.216</td>
<td>5.28</td>
<td>$765</td>
</tr>
<tr>
<td>Employees</td>
<td>21,543</td>
<td>$67,710</td>
<td>$3.143</td>
<td>174.88</td>
<td>$25,357</td>
</tr>
<tr>
<td>Housing Vacancies</td>
<td>11,361</td>
<td>$35,255</td>
<td>$3.103</td>
<td>92.22</td>
<td>$13,372</td>
</tr>
<tr>
<td>LIHEAP/CITGO Housing Fuel</td>
<td>83,977</td>
<td>$236,254</td>
<td>$2.813</td>
<td>681.70</td>
<td>$98,846</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td><strong>129,531</strong></td>
<td><strong>$379,812</strong></td>
<td><strong>1051.48</strong></td>
<td><strong>$152,465</strong></td>
<td></td>
</tr>
</tbody>
</table>

Heating cost savings of about $230,000 per year.
The Houlton / Presque Isle / Caribou area has very strong growth both in the pellet stove and pellet boiler market.

Three hour drive and 100 mile radius
The potential for some 40,000 to 60,000 households in the region to convert from heating oil to pellet fuel, each of which would use about 8 to 10 tons per year, suggests that the plant at XXX will be able to sell its production in 2015.

If the Band converts its buildings, and the schools near the facility are customers, the project will already have about ¼ of its annual production accounted for.
The total capital cost for the project is estimated to be $2,113,000. This includes all process equipment, buildings, engineering, construction, working capital needs.

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>Shifts</th>
<th>Rate</th>
<th>Hours</th>
<th>$/year</th>
<th>% Soft</th>
<th>$/year</th>
<th>$/position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant Manager</td>
<td>1</td>
<td>1</td>
<td>$75,000</td>
<td></td>
<td>30%</td>
<td>$97,500</td>
<td>$97,500</td>
<td></td>
</tr>
<tr>
<td>Raw material handler</td>
<td>1</td>
<td>4</td>
<td>$17.00</td>
<td>2,200</td>
<td>$37,400</td>
<td>$48,620</td>
<td>$194,480</td>
<td></td>
</tr>
<tr>
<td>Plant operator</td>
<td>1</td>
<td>4</td>
<td>$17.00</td>
<td>2,200</td>
<td>$37,400</td>
<td>$48,620</td>
<td>$194,480</td>
<td></td>
</tr>
<tr>
<td>Utility Operator</td>
<td>1</td>
<td>2</td>
<td>$17.00</td>
<td>2,200</td>
<td>$37,400</td>
<td>$48,620</td>
<td>$97,240</td>
<td></td>
</tr>
<tr>
<td>Mechanical / Electrician</td>
<td>1</td>
<td>2</td>
<td>$17.00</td>
<td>2,200</td>
<td>$37,400</td>
<td>$48,620</td>
<td>$97,240</td>
<td></td>
</tr>
<tr>
<td>Total Labor cost</td>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>$680,940</td>
<td></td>
</tr>
</tbody>
</table>


**Scenario 1 - Projected Cash Flows -- Return on Investment (ROI) -- Net Present Value Calculation (NPV)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Year 0</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Year 6</th>
<th>Year 7</th>
<th>Year 8</th>
<th>Year 9</th>
<th>Year 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity (less &quot;other startup&quot; and contingency costs)</td>
<td>$2,021,328</td>
<td>$2,021,328</td>
<td>$2,021,328</td>
<td>$2,021,328</td>
<td>$2,021,328</td>
<td>$2,021,328</td>
<td>$2,021,328</td>
<td>$2,021,328</td>
<td>$2,021,328</td>
<td>$2,021,328</td>
<td>$2,021,328</td>
</tr>
<tr>
<td>Change in Working Capital</td>
<td>$36,575</td>
<td>$36,575</td>
<td>$36,575</td>
<td>$36,575</td>
<td>$36,575</td>
<td>$36,575</td>
<td>$36,575</td>
<td>$36,575</td>
<td>$36,575</td>
<td>$36,575</td>
<td>$36,575</td>
</tr>
<tr>
<td>Gross Operating Cash Flow</td>
<td>$197,338</td>
<td>$382,583</td>
<td>$492,114</td>
<td>$611,929</td>
<td>$743,348</td>
<td>$887,074</td>
<td>$1,044,721</td>
<td>$1,217,275</td>
<td>$1,405,686</td>
<td>$1,611,684</td>
<td>$1,611,684</td>
</tr>
<tr>
<td>Subtotal General Selling and Admin (includes Plt.Mgr.)</td>
<td>$75,000</td>
<td>$75,000</td>
<td>$75,000</td>
<td>$75,000</td>
<td>$75,000</td>
<td>$75,000</td>
<td>$75,000</td>
<td>$75,000</td>
<td>$75,000</td>
<td>$75,000</td>
<td>$75,000</td>
</tr>
<tr>
<td>Subtract Annual Debt Service (includes interest)</td>
<td>$70,000</td>
<td>$219,917</td>
<td>$219,917</td>
<td>$219,917</td>
<td>$219,917</td>
<td>$219,917</td>
<td>$219,917</td>
<td>$219,917</td>
<td>$219,917</td>
<td>$219,917</td>
<td>$219,917</td>
</tr>
<tr>
<td>Annual Taxes</td>
<td>$174</td>
<td>$184</td>
<td>$194</td>
<td>$204</td>
<td>$216</td>
<td>$228</td>
<td>$240</td>
<td>$253</td>
<td>$267</td>
<td>$282</td>
<td>$282</td>
</tr>
</tbody>
</table>

**Scenario 2 - Projected Cash Flows -- Return on Investment (ROI) -- Net Present Value Calculation (NPV) WITH COST SAVINGS FROM FUEL SWITCHING**

<table>
<thead>
<tr>
<th>Year</th>
<th>Year 0</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
<th>Year 5</th>
<th>Year 6</th>
<th>Year 7</th>
<th>Year 8</th>
<th>Year 9</th>
<th>Year 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity (less &quot;other startup&quot; and contingency costs)</td>
<td>$2,021,328</td>
<td>$2,021,328</td>
<td>$2,021,328</td>
<td>$2,021,328</td>
<td>$2,021,328</td>
<td>$2,021,328</td>
<td>$2,021,328</td>
<td>$2,021,328</td>
<td>$2,021,328</td>
<td>$2,021,328</td>
<td>$2,021,328</td>
</tr>
<tr>
<td>Change in Working Capital</td>
<td>$36,575</td>
<td>$36,575</td>
<td>$36,575</td>
<td>$36,575</td>
<td>$36,575</td>
<td>$36,575</td>
<td>$36,575</td>
<td>$36,575</td>
<td>$36,575</td>
<td>$36,575</td>
<td>$36,575</td>
</tr>
<tr>
<td>Gross Operating Cash Flow</td>
<td>$197,338</td>
<td>$382,583</td>
<td>$492,114</td>
<td>$611,929</td>
<td>$743,348</td>
<td>$887,074</td>
<td>$1,044,721</td>
<td>$1,217,275</td>
<td>$1,405,686</td>
<td>$1,611,684</td>
<td>$1,611,684</td>
</tr>
<tr>
<td>$527,907</td>
<td>$527,907</td>
<td>$527,907</td>
<td>$527,907</td>
<td>$527,907</td>
<td>$527,907</td>
<td>$527,907</td>
<td>$527,907</td>
<td>$527,907</td>
<td>$527,907</td>
<td>$527,907</td>
<td></td>
</tr>
<tr>
<td>Cash at the end of the period</td>
<td>$108,725</td>
<td>$11,746</td>
<td>$99,413</td>
<td>$296,607</td>
<td>$613,620</td>
<td>$1,062,049</td>
<td>$1,654,207</td>
<td>$2,404,011</td>
<td>$3,326,369</td>
<td>$4,437,139</td>
<td>$5,753,906</td>
</tr>
<tr>
<td>EBITDA</td>
<td>$2,111,628</td>
<td>$153,073</td>
<td>$256,420</td>
<td>$369,811</td>
<td>$494,543</td>
<td>$613,620</td>
<td>$1,062,049</td>
<td>$1,654,207</td>
<td>$2,404,011</td>
<td>$3,326,369</td>
<td>$4,437,139</td>
</tr>
<tr>
<td>ROI for total CAPEX (10 Yrs.)</td>
<td>14.10%</td>
<td>15.23%</td>
<td>16.36%</td>
<td>17.49%</td>
<td>18.62%</td>
<td>19.75%</td>
<td>20.88%</td>
<td>21.91%</td>
<td>22.94%</td>
<td>23.97%</td>
<td>24.99%</td>
</tr>
<tr>
<td>PV (@ 8%, 10 Yrs.) Equity Cash Out</td>
<td>$5,225,999</td>
<td>$5,225,999</td>
<td>$5,225,999</td>
<td>$5,225,999</td>
<td>$5,225,999</td>
<td>$5,225,999</td>
<td>$5,225,999</td>
<td>$5,225,999</td>
<td>$5,225,999</td>
<td>$5,225,999</td>
<td>$5,225,999</td>
</tr>
</tbody>
</table>

**Conversion of Buildings over first four years**
## Free Cash Flows versus wood costs and gate pellet prices (second year of operation)

<table>
<thead>
<tr>
<th>Year</th>
<th>$155</th>
<th>$160</th>
<th>$165</th>
<th>$170</th>
<th>$175</th>
<th>$180</th>
<th>$185</th>
<th>$190</th>
<th>$195</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>$112,940</td>
<td>$164,296</td>
<td>$215,651</td>
<td>$267,007</td>
<td>$318,362</td>
<td>$369,717</td>
<td>$421,073</td>
<td>$472,428</td>
<td>$523,783</td>
</tr>
<tr>
<td>36</td>
<td>$95,343</td>
<td>$146,699</td>
<td>$198,054</td>
<td>$249,409</td>
<td>$300,765</td>
<td>$352,120</td>
<td>$403,476</td>
<td>$454,831</td>
<td>$506,186</td>
</tr>
<tr>
<td>37</td>
<td>$77,746</td>
<td>$129,102</td>
<td>$180,457</td>
<td>$231,812</td>
<td>$283,168</td>
<td>$334,523</td>
<td>$385,879</td>
<td>$437,234</td>
<td>$488,599</td>
</tr>
<tr>
<td>38</td>
<td>$60,149</td>
<td>$111,504</td>
<td>$162,860</td>
<td>$214,215</td>
<td>$265,571</td>
<td>$316,926</td>
<td>$368,281</td>
<td>$419,637</td>
<td>$470,992</td>
</tr>
<tr>
<td>40</td>
<td>$24,955</td>
<td>$76,310</td>
<td>$127,666</td>
<td>$179,021</td>
<td>$230,376</td>
<td>$281,732</td>
<td>$333,087</td>
<td>$384,443</td>
<td>$435,798</td>
</tr>
<tr>
<td>41</td>
<td>$7,358</td>
<td>$58,713</td>
<td>$110,069</td>
<td>$161,424</td>
<td>$212,779</td>
<td>$264,135</td>
<td>$315,490</td>
<td>$366,846</td>
<td>$418,201</td>
</tr>
<tr>
<td>42</td>
<td>($10,239)</td>
<td>$41,116</td>
<td>$92,472</td>
<td>$143,827</td>
<td>$195,182</td>
<td>$246,538</td>
<td>$297,893</td>
<td>$349,248</td>
<td>$400,604</td>
</tr>
<tr>
<td>43</td>
<td>($27,836)</td>
<td>$23,519</td>
<td>$74,874</td>
<td>$126,230</td>
<td>$177,585</td>
<td>$228,941</td>
<td>$280,296</td>
<td>$331,651</td>
<td>$383,007</td>
</tr>
<tr>
<td>44</td>
<td>($45,433)</td>
<td>$5,922</td>
<td>$57,277</td>
<td>$108,633</td>
<td>$159,988</td>
<td>$211,344</td>
<td>$262,699</td>
<td>$314,054</td>
<td>$365,410</td>
</tr>
<tr>
<td>45</td>
<td>($63,031)</td>
<td>($11,675)</td>
<td>$39,680</td>
<td>$91,036</td>
<td>$142,391</td>
<td>$193,746</td>
<td>$245,102</td>
<td>$296,457</td>
<td>$347,813</td>
</tr>
<tr>
<td>46</td>
<td>($80,628)</td>
<td>($29,272)</td>
<td>$22,083</td>
<td>$73,439</td>
<td>$124,794</td>
<td>$176,149</td>
<td>$227,505</td>
<td>$278,860</td>
<td>$330,216</td>
</tr>
<tr>
<td>47</td>
<td>($97,225)</td>
<td>($46,669)</td>
<td>$4,486</td>
<td>$55,841</td>
<td>$107,197</td>
<td>$158,552</td>
<td>$209,908</td>
<td>$261,263</td>
<td>$312,618</td>
</tr>
<tr>
<td>48</td>
<td>($115,822)</td>
<td>($64,466)</td>
<td>($13,111)</td>
<td>$38,244</td>
<td>$89,600</td>
<td>$140,955</td>
<td>$192,311</td>
<td>$243,666</td>
<td>$295,021</td>
</tr>
<tr>
<td>49</td>
<td>($133,419)</td>
<td>($82,063)</td>
<td>($30,708)</td>
<td>$20,647</td>
<td>$72,003</td>
<td>$123,358</td>
<td>$174,713</td>
<td>$226,069</td>
<td>$277,424</td>
</tr>
<tr>
<td>50</td>
<td>($151,016)</td>
<td>($99,661)</td>
<td>($48,305)</td>
<td>$3,050</td>
<td>$54,406</td>
<td>$105,761</td>
<td>$157,116</td>
<td>$208,472</td>
<td>$259,827</td>
</tr>
</tbody>
</table>
Thank You!

William Strauss

My home in western Maine is in this photo.

All of the forest you see is SFI certified and is managed and used for timber harvesting.